27

CLAIMS

1.   A receiver apparatus (32) for receiving, by a plurality of receiver antennas (105-1, 105-2), transmission signals (s_1, s_2) transmitted from a transmitter apparatus (31) by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner to demodulate them, the receiver apparatus comprising:

calculation means (301) for measuring   demodulated signals to calculate a physical amount in order to estimate a radio line quality with respect to each of signal series;

determination means (111) for evaluating the radio line quality based upon the physical amount calculated by said calculation means so as to determine a transmission parameter (X_{next}) in a next transmission operation by said transmitter apparatus with respect to each of the signal series;

transmission means (71) for transmitting the transmission parameter determined by said determination means to said transmitter apparatus; and

detection means (107) for detecting a change in the transmission parameters from received signals (y_1, y_2) with respect to each of the signal series.

2.   A receiver apparatus as claimed in claim 1 wherein,

said physical amount is an SINR of said demodulated signals.

3.   A receiver apparatus as claimed in claim 1 or claim 2 wherein,

said transmission parameter is a modulation level in mapping.

4.   A radio communication system comprising a transmitter apparatus (31) for transmitting transmission signals (s_1, s_2) by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner; and a receiver apparatus (32) for receiving said transmission signals by a plurality of receiver antennas (105-1, 105-2) so as to demodulate them; wherein,

said receiver apparatus (32) comprises:

28

calculation means (301) for measuring demodulated signals to calculate a physical amount in order to estimate a radio line quality with respect to each of signal series;

determination means (111) for evaluating the radio line quality based upon the physical amount calculated by said calculation means so as to determine a transmission parameter (X_{next}) in a next transmission operation by said transmitter apparatus with respect to each of the signal series;

transmission means (71) for transmitting the transmisson parameter determined by said determination means to said transmitter apparatus; and

detection means (107) for detecting a change in the transmission parameter from received signals (y_1, y_2) with respect to each of the signal series; and wherein,

said transmitter apparatus (31) comprises:

reception means (72) for receiving said transmission parameter transmitted by said determination means; and

means (201-1, 201-2) for controlling a transmission operation with respect to each of the signal series based upon said transmission parameter received by said reception means.

5. A radio communication system as claimed in claim 4 wherein,

said physical amount is an SINR of said demodulated signals.

6. A radio communication system as claimed in claim 3 or claim 4 wherein,

said transmission parameter is a modulation level in mapping.

7. A receiver apparatus (52; 62) for receiving, by a plurality of receiver antennas (105-1 to 105-2; 105-1 to 105-4), transmission signals (s_1, s_2) transmitted from a transmitter apparatus (51; 61) by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner and for estimating a channel matrix (H) for causing the transmission signals (s_1, s_2) to be related to received

29

signals (r_1, r_2 ; r_1 to r_4) to demodulate the received signals based upon said channel matrix; the receiver apparatus comprising:

calculation means (501; 601) for calculating a physical amount so as to estimate a radio line quality with respect to each of signal series based upon only said channel matrix (H);

determination means (111) for evaluating the radio line quality based upon the physical amount calculated by said calculation means so as to determine a transmission parameter (X_{next}) in a next transmission operation by said transmitter apparatus with respect to each of the signal series;

transmission means (71) for transmitting the transmission parameter determined by said determination means to said transmitter apparatus; and

detection means (107) for detecting a change in the transmission parameter from the received signals   with respect to each of the signal series.

8.   A receiver apparatus as claimed in claim 7 wherein,

said physical amount is an SNR of said demodulated signals.

9.   A receiver apparatus as claimed in claim 7 wherein,

said physical amount corresponds to a sum of SNRs of signals which are detected by said plurality of receiver antennas when it is   assumed that said plurality of transmitter antennas separately transmit signals.

10.   A receiver apparatus as claimed in claim 9 wherein,

said physical amount corresponds to a sum of one, or a plurality of said SNRs having larger values.

11.   A receiver apparatus as claimed in any one of claim 7 to claim 10 wherein,

said transfer parameter is a modulation level in mapping.

12.   A radio communication system comprising a transmitter apparatus (51; 61) for transmitting transmission signals (s_1, s_2) by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner; and a receiver apparatus (52; 62)

30

for receiving said transmission signals (s_1, s_2) by a plurality of receiver antennas (105-1 to 105-2; 105-1 to 105-4) and for estimating a channel matrix (H) for causing the transmission signals (s_1, s_2) to be related to received signals (r_1, r_2; r_1 to r_4)to demodulate the received signals based upon said channel matrix; wherein,

said receiver apparatus comprises:

calculation means (501; 601) for calculating a physical amount so as to estimate a radio line quality with respect to each of signal series based upon only said channel matrix (H);

determination means (111) for evaluating the radio line quality based upon the physical amount calculated by said calculation means so as to determine a transmission parameter (X_{next}) in a next transmission operation by said transmitter apparatus with respect to each of the signal series;

transmission means (71) for transmitting the transmission parameter determined by said determination means to said transmitter apparatus; and

detection means (107) for detecting a change in the transmission parameter from the received signals with respect to each of the signal series; and wherein,

said transmitter apparatus comprises:

reception means (72) for receiving said transmission parameter transmitted by said determining means; and

means (201-2, 201-2) for controlling a transmission operation with respect to each of the signal series based upon said transmission parameter received by said reception means.

13.   A radio communication system as claimed in claim 12 wherein, said physical amount is an SNR of said demodulated signals.

14.   A radio communication system as claimed in claim 12 wherein, said physical amount corresponds to a sum of SNRs of signals which are

31

detected by said plurality of receiver antennas when it is　assumed that said plurality of transmitter antennas separately transmit signals.

15.　A radio communication system as claimed in claim 14 wherein,

said physical amount corresponds to a sum of one, or a plurality of said SNRs having larger values.

16.　A radio communication system as claimed in any one of claim 12 to claim 15 wherein:

said transfer parameter is a modulation level in mapping.

17.　A transmitter apparatus (31;51;61) for transmitting data by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner to a receiver apparatus (32;52;62) for receiving by a plurality of receiver antennas (105-1, 105-2; 105-1 to 105-4), the transmitter apparatus comprising:

reception means (72) for receiving a transmission parameter transmitted by said receiver apparatus; and

means (201-1, 201-2) for controlling a transmission operation with respect to each of signal series based upon said transmission parameter received by said reception means.

18.　A transmitter apparatus (51A; 61A) for transmitting data by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner to a receiver apparatus (52A, 62A) for receiving by a plurality of receiver antennas (105-1, 105-2; 105-1 to 105-4), said transmitter apparatus being used in a radio communication system in which a channel matrix for causing the signal transmitted by said transmitter apparatus to be related to said signal detected by said receiver apparatus becomes identical to a channel matrix for causing the signal transmitted by said receiver apparatus to be related to said signal detected by said transmitter apparatus; wherein,

said transmitter apparatus comprises:

estimation means (106) for estimatinig said channel matrix;

32

calculation means (501; 601) for calculating a physical amount so as to estimate a radio line quality with respect to each of signal series based upon only said channel matrix;

determination means (111) for evaluating the radio line quality based upon the physical amount calculated by said calculation means so as to determine a transmission parameter in a next transmission operation with respect to each of signal series; and

means (201-1, 201-2) for controlling the transmission operation with respect to each of the signal series based upon the transmission parameter determined by said determination means.

19.　A transmitter apparatus as claimed in claim 18 wherein,

said physical amount corresponds to an SNR of   demodulated signals of said receiver apparatus.

20.　A transmitter apparatus as claimed in claim 18 wherein,

said physical amount corresponds to a sum of SNRs of signals which are detected by said plurality of receiver antennas when it is   assumed that said plurality of transmitter antennas separately transmit signals.

21.　A transmitter apparatus as claimed in claim 20 wherein,

said physical amount corresponds to a sum of one, or a plurality of said SNRs having larger values.

22.　A transmitter apparatus as claimed in any one of claim 18 to claim 21 wherein,

said transmission parameter is a modulation level in mapping.

23.　A radio communication system comprising a transmitter apparatus (51A; 61A) for transmitting transmission signals (s_1, s_2) by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner; and a receiver apparatus (52A; 62A) for receiving said transmission signals (s_1, s_2) by a plurality of receiver antennas (105-1 to 105-2; 105-1 to 105-4), a channel matrix

33

(H) for causing the signal transmitted by said transmitter apparatus to be related to said signal detected by said receiver apparatus becomes identical to a channel matrix (H) for causing the signal transmitted by said receiver apparatus to be related to said signal detected by said transmitter apparatus; wherein,

said transmitter apparatus comprises:

estimation means (106) for estimating said channel matrix;

calculation means (501; 601) for calculating a physical amount so as to estimate a radio line quality with respect to each of signal series based upon only said channel matrix;

determination means (111) for evaluating the radio line quality based upon the physical amount calculated by said calculation means so as to determine a transmission parameter in a next transmission operation with respect to each of signal series; and

means (201-1, 201-2) for controlling the transmission operation with respect to each of the signal series based upon the transmission parameter determined by said determination means; and wherein,

said receiver apparatus comprises:

means (107) for detecting a change in said transmission parameter from the signals received from said transmitter apparatus with respect to each of signal series.

24.   A radio communication system as claimed in claim 23 wherein,

said physical amount corresponds to an SNR of   demodulated signals of said receiver apparatus.

25.   A radio communication system as claimed in claim 23 wherein,

said physical amount corresponds to a sum of SNRs of signals which are detected by said plurality of receiver antennas when it is   assumed that said plurality of transmitter antennas separately transmit signals.

26.   A radio communication system as claimed in claim 25 wherein,

34

said physical amount corresponds to a sum of one, or a plurality of said SNRs having larger values.

27.　A radio communication system as claimed in any one of claim 23 to claim 26 wherein,

said transmission parameter is a modulation level in mapping.

28.　A receiver apparatus (52A; 62A) for receiving, by a plurality of receiver antennas (105-1 to 105-2; 105-1 to 105-4), transmission signals (s_1, s_2) transmitted from a transmitter apparatus (51A; 61A) by a plurality of transmitter antennas (104-1, 104-2) in a parallel manner and for estimating a channel matrix (H) for causing the transmission signals (s_1, s_2) to be related to received signals (r_1, r_2 ; r_1 to r_4) to demodulate the received signals based upon said channel matrix; the receiver apparatus comprising:

means (107) for detecting a change in a transmission parameter with respect to each of signal series from the signal received from said transmitter apparatus.